

GAS & DUAL FUEL POWER PLANT

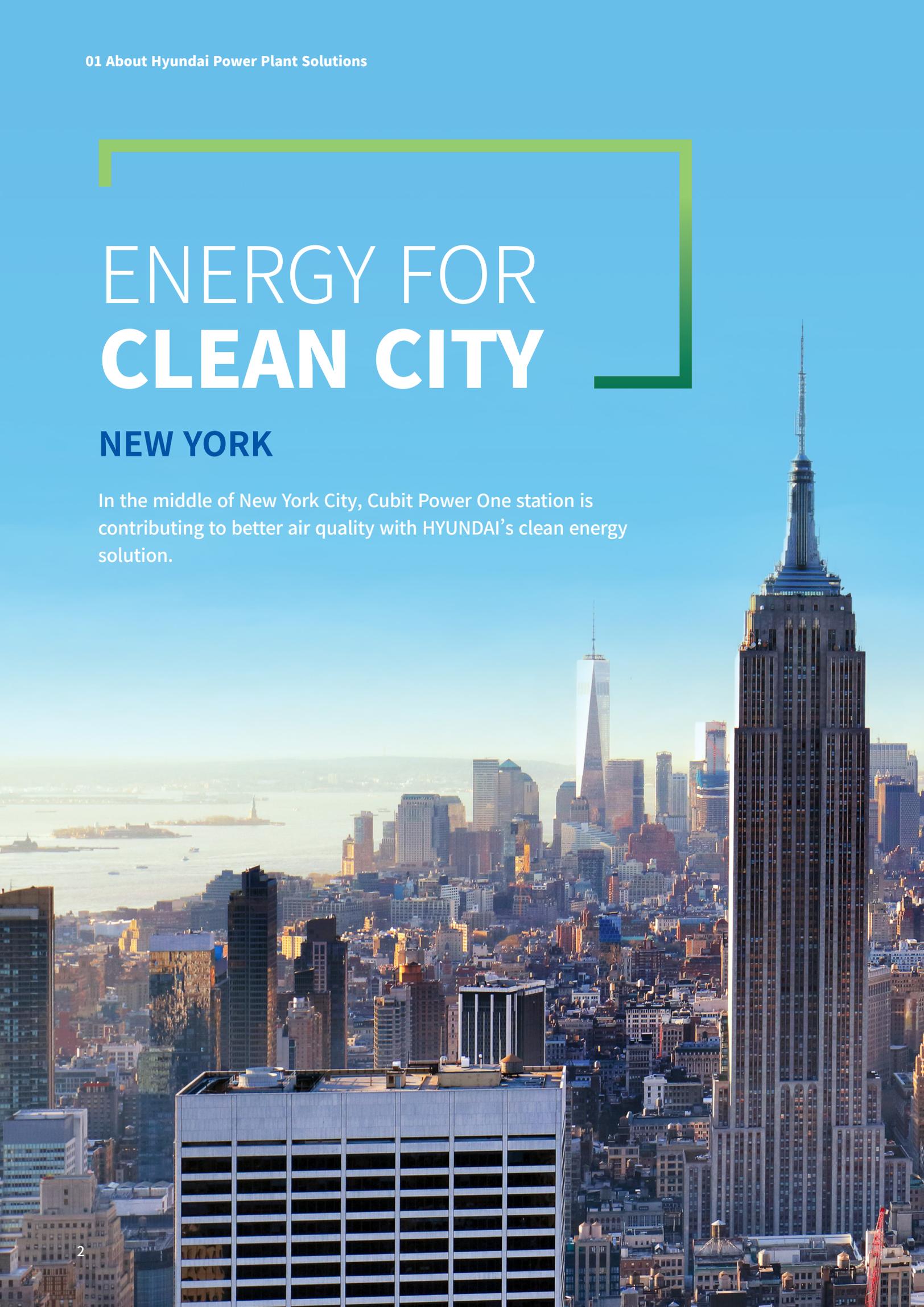
**HYUNDAI
POWER PLANT SOLUTIONS**

Lowest Capex Lower Emission
And High Efficiency

ENERGY FOR CLEAN CITY

NEW YORK

In the middle of New York City, Cubit Power One station is contributing to better air quality with HYUNDAI's clean energy solution.



Gas Engine Power Plant



The Cubit Power One adopted HYUNDAI's 11MW gas engines(12H35/40GV x 2sets) help reducing air pollution with SCR(Selective Catalytic Reduction) and improving high efficiency with CHP(Combined Heat & Power) system. The Cubit Power One station has shown remarkable performances in stable electric power supply regardless of hot and humid summer and heavily snowing winter in Staten Island.



The power plant is 1 hour away from JFK



KEY FIGURES

Total Output	11MW
Customer	Cubit Power One
Operating Mode	Continuous
Gensets	12H35/40GV x 2sets
Fuel	Natural Gas
Scope	DG sets
Delivered	2018.05

Scope Of Supply



- ① — Power house
- ② — HAM & EGM unit
- ③ — Engine
- ④ — Exhaust gas boiler
- ⑤ — Exhaust gas silencer & Stack
- ⑥ — Cooling radiator
- ⑦ — Fuel tank farm
- ⑧ — Water tanks
- ⑨ — Fire fighting house
- ⑩ — Purifier & Pump house
- ⑪ — Substation
- ⑫ — Workshop/Warehouse
- ⑬ — Administration building
- ⑭ — Electrical & Control building
- ⑮ — Step-up transformer
- ⑯ — Guard house

* HAM : HIMSSEN Aux. Module
EGM : Exhaust Gas Module



Engineering
Procurement
Construction



Engineering
(Basic + Detail)



Bulk
Materials



Equipment
Supply

HYUNDAI'S GAS & DUAL FUEL POWER PLANT

“HYUNDAI's gas and dual fuel power plant ensures not only safety of the power plant but also eco-friendly environment. HYUNDAI's dual fuel power plant creates added value through offering true flexibility in fuel selection and in our ability to respond to various operational demands.”

Safe System

When using gas as the power source, safety is a crucial issue. The control/safety systems and sensors created by HYUNDAI, are installed and prepared for safe gas operation.

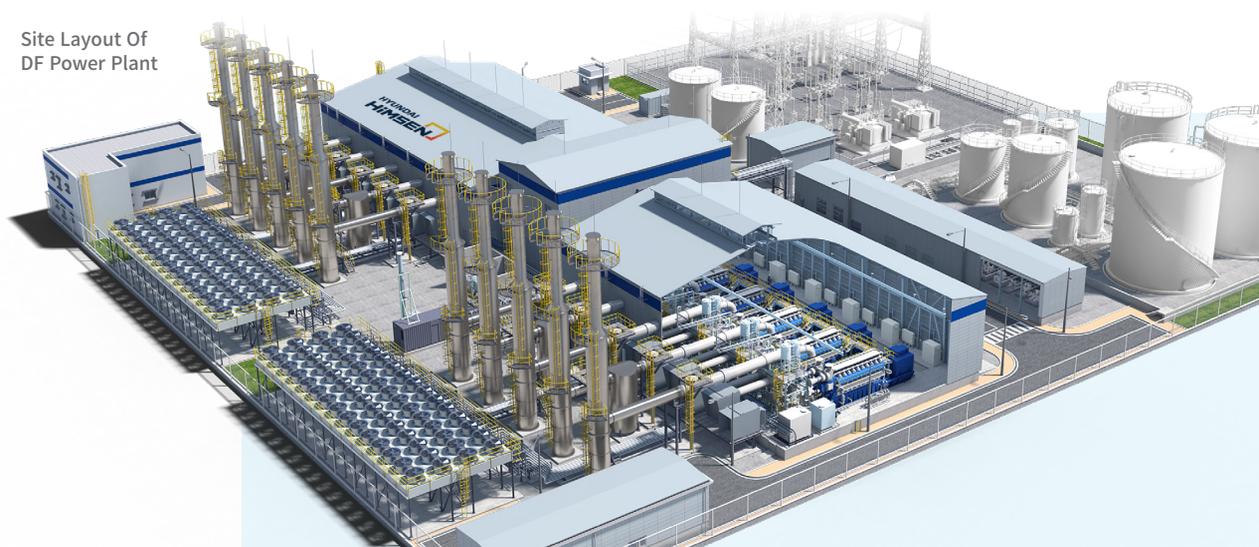
Eco-friendly

The gas/dual fuel power plant has the advantage of reducing the emission rate. HYUNDAI's gas engines are credible for its low NOx emission rate, smoke-less operation range, low vibration, and less noise.

Flexible Fuel Support For Dual Fuel

The dual fuel power plant offers total fuel flexibility. When gas operation is interrupted or gas shortage occurs, the system switches to diesel fuel operation seamlessly and swiftly.

Site Layout Of DF Power Plant



Who Is It For?

- For those who are looking for efficient and economical power plant.
- For those who want to follow environmental regulations.
- Dual fuel is often used for places where there is unstable gas supply and diesel can be used for backup.

Why Are They Good?

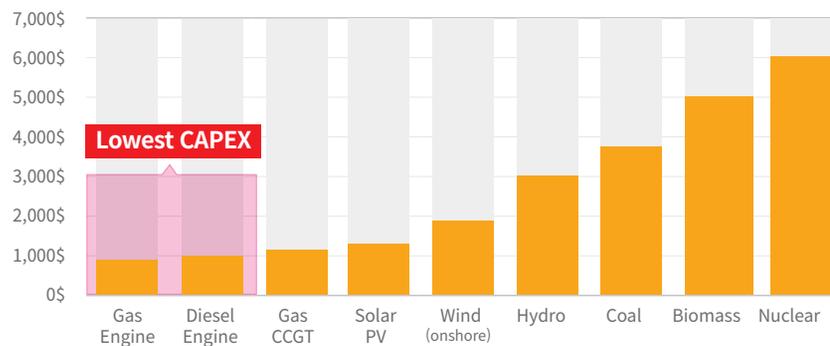
1. LOWER EMISSION

Gas engines have lower emission rates and high efficiency in energy production. As emission regulations become stricter, gas operation has advantages such as low NO_x / CO₂, and no SO_x / Particle emissions.

2. ECONOMICAL

Gas engines are one of the most economical options in the various power sources. The operation and maintenance costs are especially lower than other plant running on different fuels.

CAPEX For Various Power Sources



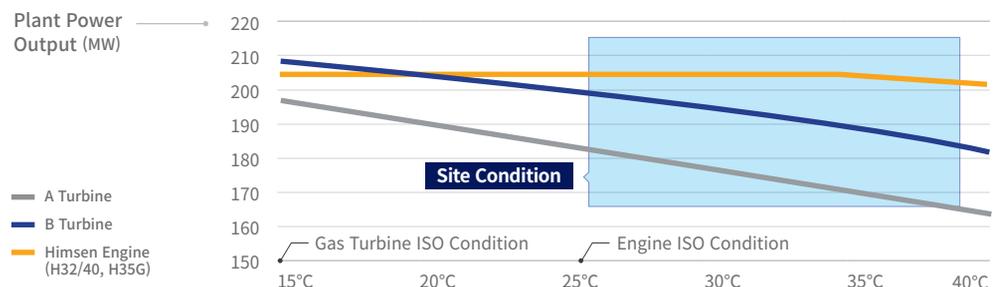
3. QUICK START TIME

Gas engines have a shorter start time compared with gas turbines. It takes 15 to 40 minutes for turbines to start, whereas gas engine only takes 2 to 7 minutes.

4. STABLE POWER OUTPUT

Gas engines are able to operate more stable than gas turbine under different ambient temperatures. While turbine power plant shows around 10% derating, gas engine power plant shows only 1% derating. Gas Turbine is also more sensitive at part load.

Ambient Temperature Impact To Gas Turbine & Engine Plant Output



Case ① : GPP

B1 25MW GPP Iran

The most efficient power plant in the country

The 25MW gas engine power plant in Beshel Industrial Park in the north of Iran is the most efficient plant in the country. It has the capacity of generating 25MW of electricity for increasing the stability of the grid in the North of Iran.

Total Output	25MW
Customer	BNB
Operating Mode	Base load
Gensets	18H35/40GV x 3sets
Fuel	Natural Gas
Scope	Genset + Equipment supply
Delivered	2013



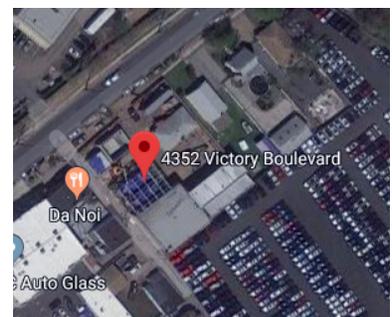
Case ② : GPP

CUBIT 11MW GPP New York

Eco-friendly and High efficiency power plant

The Cubit Power One adopted HYUNDAI's 11MW gas engines(12H35/40GV x 2sets) help reducing air pollution with SCR(Selective Catalytic Reduction) and improving high efficiency with CHP(Combined Heat & Power) system. The Cubit Power One station has shown remarkable performances in stable electric power supply regardless of hot and humid summer and heavily snowing winter in Staten Island.

Total Output	11MW
Customer	Cubit Power One
Operating Mode	Base load
Gensets	12H35/40GV x 2sets
Fuel	Natural Gas
Scope	Genset supply
Delivered	2018



Case ③ : GPP Enclosure

Brezhnev 12MW GPP Russia

Extreme cold condition power plant

This is for IPP project to supply electric power in Kamaz factory.

To catch customer's short delivery time, HYUNDAI recommended to use enclosure type power plant and provided full technical support for engineering.

Under HYUNDAI's full technical supports, it was successfully constructed within 12 months after the contract.

Total Output	12MW
Customer	NG ENERGO
Operating Mode	Base load
Gensets	9H35/40G x 3sets
Fuel	Natural Gas
Scope	Genset supply
Delivered	2016



Case ④ : DFPP

Termonorte 93MW DFPP Colombia

The biggest dual fuel engine power plant in Colombia

In February 2017, HYUNDAI received an order from TERMONORTE S.A.S E.S.P., for engineering, procurement and construction. The contract consists of 10 sets of HiMSEN dual fuel engine generator to supply continuous power to national grid in Colombia, South America.

The power plant was handed over in November 2018 to the customer and is currently under commercial operation.

Total Output	93MW
Customer	TERMONORTE
Operating Mode	Base load
Gensets	20H35DFV x 10sets
Fuel	Natural Gas, Diesel Oil, Heavy Fuel Oil
Scope	EPC
Delivered	2018.11



MAKING YOUR POWER PLANT WITH THE LATEST TECHNOLOGY

HYUNDAI DF Engine, H54DFV

Two-Stage T/C System 1

High efficiency and no derating even for sites with high ambient temperature and altitude

Extreme miller cycle, Two-stage T/C

- Advanced IVC
- Effective compression ratio
- Higher Engine efficiency
- Decreased NOx emission

General Info

EFFICIENCY_TSTC

51.2%

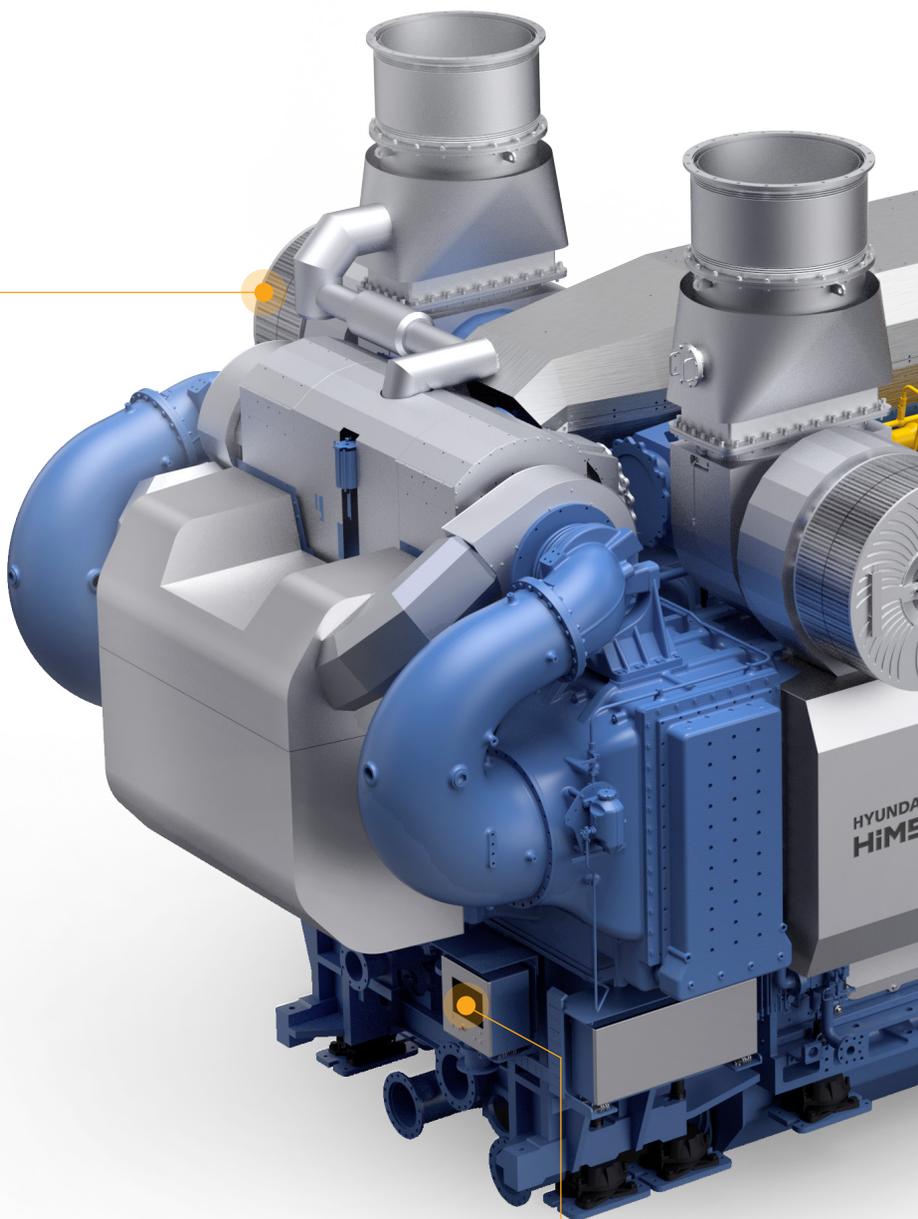
EFFICIENCY_SSTC

50.2%

OUTPUT RANGE

17.6~26.5 MW_m

* TSTC : Two Stage Turbo Charger
SSTC : Single Stage Turbo Charger



Control System 5

Safe and optimal engine operation

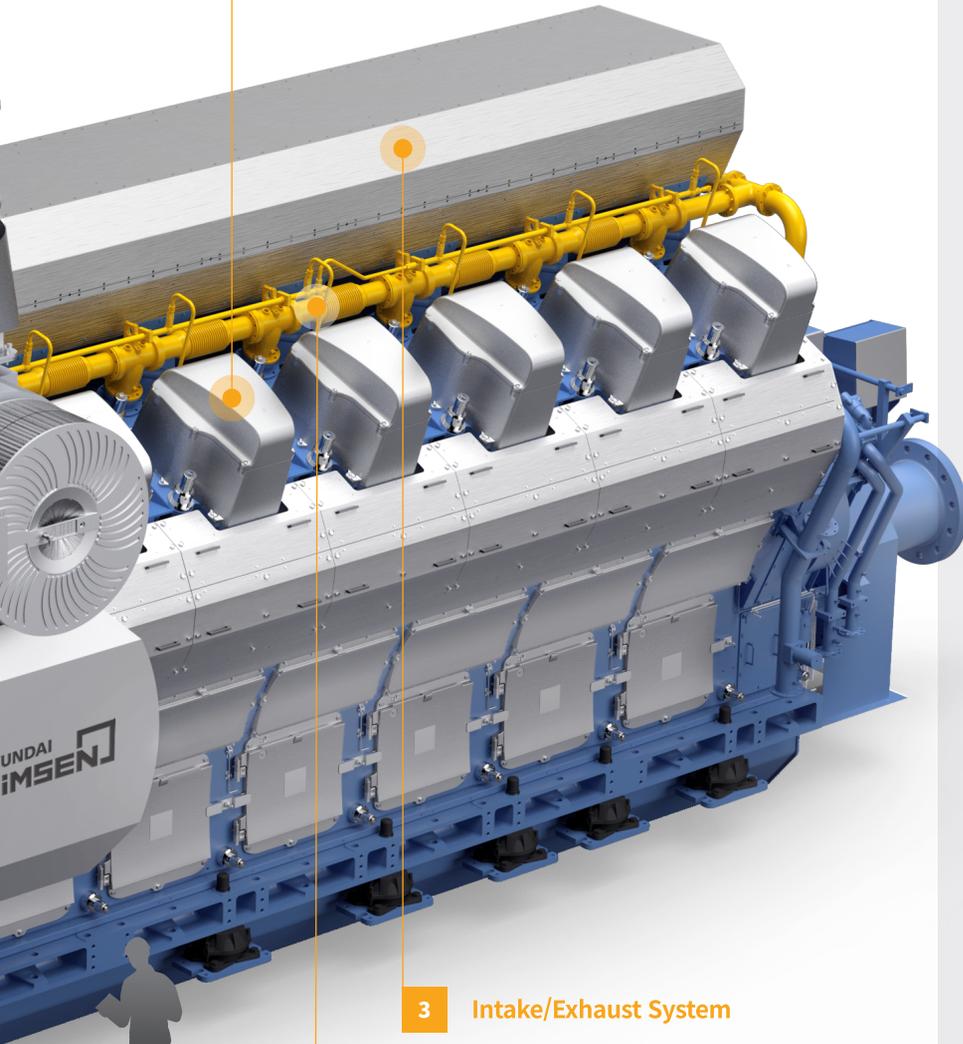
HI-MECS, Cylinder balancing, Knock control

2 Combustion System

High power and efficiency

MP/Main injector, Piston bowl, Gas/Diesel combined simulation

- Output / Cylinder : 1470kWm
- Engine Cycle : 4-stroke
- Bore : 540/600mm
- Engine Speed : 600rpm



3 Intake/Exhaust System

Low load performance and automatic NOx control

Dual valve timing, Exhaust waste gate

4 Gas Supply System

Even mixture distribution & Low knocking

Gas mixer optimization, Port flow CFD

BENEFITS FOR YOU

• Steady Performance

One of the major important factors of an engine is its consistency in performance. HiMSEN engine's professional engineering can assure stable power output even after the years.

• Easy Maintenance

HYUNDAI engines are thoughtfully modularized for easy maintenance. Many O&M managers working on HYUNDAI's power plant comment that the intuitive and stable engine design makes the site easier to be operated. Also, the pipeless design can prevent deformations.

• Eco-friendly

HiMSEN engines have been designed with the environmental issues in mind. HYUNDAI always looks for various ways to protect the environment. Low NOx emissions / Smokeless at whole operation range / Low vibration & noise.

• High Efficiency



* Specifications are subject to change without prior notice.

MODULAR DESIGN

‘FASTER, EASIER, AND EVEN BETTER.’

Compared with traditional design, HYUNDAI's prefabricated modules shorten and simplify the procurement and installation process, even with lower price.

TIME SAVING

Enable to reduce 5 to 6 months of time in planning and construction.

Planning



Construction

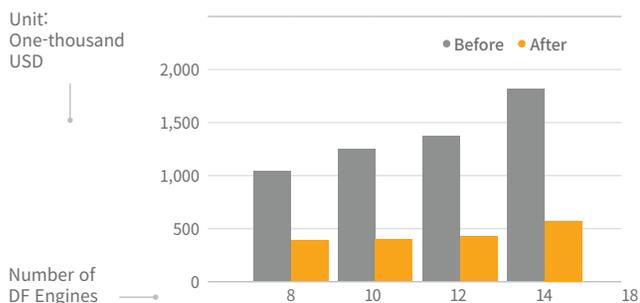


• For 10(Ten) 20H35DF Engines

• For Engines Inside DG Building + Aux.Equipment + Piping

COST SAVING

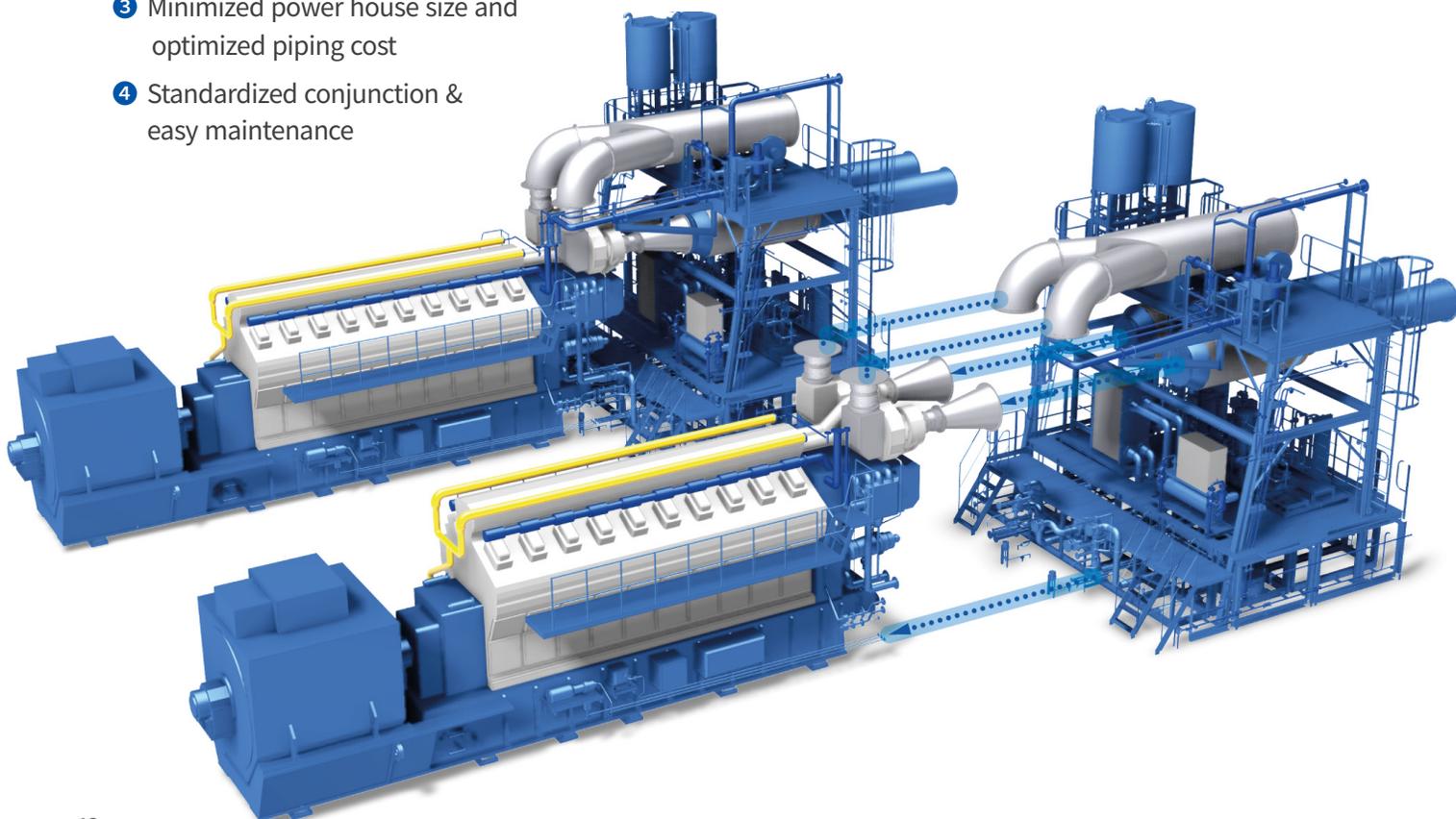
Unit: One-thousand USD



* The estimated numbers are for cases where there are IPP/EPC contracts (DF Engine), and it may differ among countries.

HiMSEN Aux. Module(HAM)

- 1 Faster and simple construction on site
- 2 Consistent control
- 3 Minimized power house size and optimized piping cost
- 4 Standardized conjunction & easy maintenance



HIMSEN ENGINE LINE-UP FOR STATIONARY GENSETS

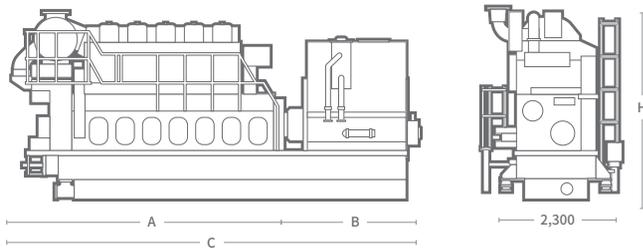
‘HiMSEN’[®] is the registered brand name of HYUNDAI’s own design engine and the abbreviation of ‘Hi-touch Marine & Stationary ENGINE’.



ENGINES

Gas Fuel

H35/40G Bore: 350mm Stroke: 400mm



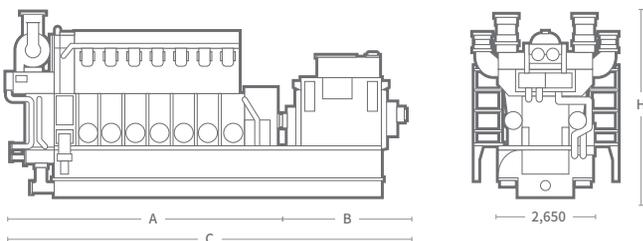
Main Data

Speed	720rpm		750rpm		Dimension(mm)				Dry Mass(ton)	
	60Hz		50Hz							
Frequency	Eng.(kw)	Gen.(kw)	Eng.(kw)	Gen.(kw)	A	B	C	H	Engine	GenSet
6H35/40G	2,880	2,764	2,880	2,764	5,760	3,130	8,890	3,959	33.7	68.6
7H35/40G	3,360	3,225	3,360	3,225	6,112	3,374	9,486	4,130	38.6	77.1
8H35/40G	3,840	3,686	3,840	3,686	6,602	3,594	10,196	4,130	41.5	82.0
9H35/40G	4,320	4,147	4,320	4,147	7,092	4,097	11,189	4,130	44.6	89.1

Based on alternator efficiency of 96%.

Dimensions

H35/40GV Bore: 350mm Stroke: 400mm



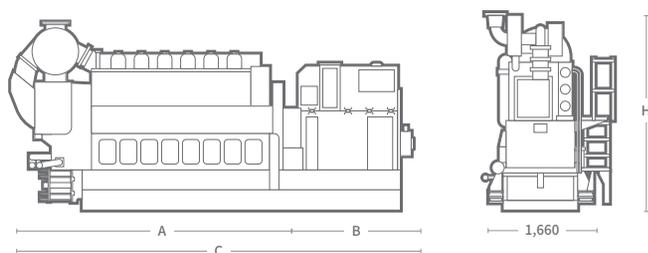
Main Data

Speed	720rpm		750rpm		Dimension(mm)				Dry Mass(ton)	
	60Hz		50Hz							
Frequency	Eng.(kw)	Gen.(kw)	Eng.(kw)	Gen.(kw)	A	B	C	H	Engine	GenSet
12H35/40GV	5,760	5,558	5,760	5,558	6,624	3,760	10,384	4,723	56.0	108.8
14H35/40GV	6,720	6,518	6,720	6,518	7,295	3,860	11,155	4,723	63.3	121.3
16H35/40GV	7,680	7,449	7,680	7,449	7,914	3,479	11,393	4,723	69.1	130.9
18H35/40GV	8,640	8,380	8,640	8,380	8,585	3,859	12,444	4,794	76.3	141.2
20H35/40GV	9,600	9,360	9,600	9,360	9,344	3,659	13,003	4,794	84.0	153.9

Based on alternator efficiency of 96.5-97.5%.

Dual Fuel

H27DF Bore: 270mm Stroke: 330mm



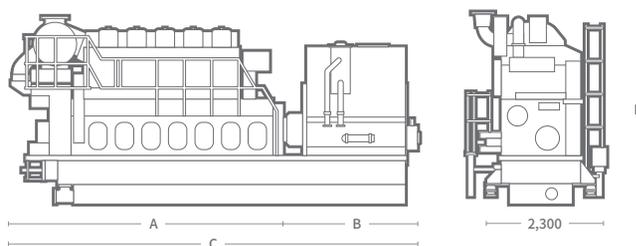
Main Data

Dimensions

Speed	900rpm		1,000rpm		Dimension(mm)				Dry Mass(ton)	
	60Hz		50Hz							
	Eng.(kW)	Gen.(kW)	Eng.(kW)	Gen.(kW)	A	B	C	H	Engine	GenSet
6H27DF	1,710	1,624	1,860	1,767	4,414	2,262	6,676	3,103	23.5	33.7
7H27DF	1,995	1,895	2,170	2,061	4,797	2,262	7,059	3,241	27.7	37.7
8H27DF	2,280	2,177	2,480	2,368	5,311	2,340	7,651	3,371	34.0	44.8
9H27DF	2,565	2,462	2,790	2,678	5,691	2,490	8,181	3,371	36.2	47.2

Based on alternator efficiency of 95-96%.

H35DF Bore: 350mm Stroke: 400mm



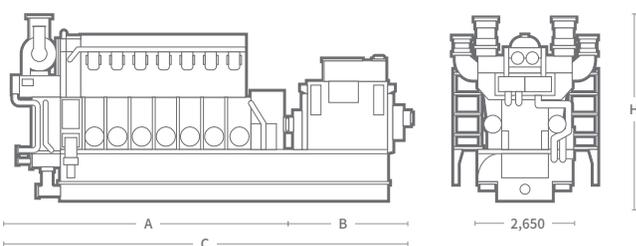
Main Data

Dimensions

Speed	720rpm		750rpm		Dimension(mm)				Dry Mass(ton)	
	60Hz		50Hz							
	Eng.(kW)	Gen.(kW)	Eng.(kW)	Gen.(kW)	A	B	C	H	Engine	GenSet
6H35DF	2,880	2,764	2,880	2,764	5,760	3,130	8,890	3,959	33.7	68.6
7H35DF	3,360	3,225	3,360	3,225	6,112	3,374	9,486	4,130	38.6	77.1
8H35DF	3,840	3,686	3,840	3,686	6,602	3,594	10,196	4,130	41.5	82.0
9H35DF	4,320	4,147	4,320	4,147	7,092	4,097	11,189	4,130	44.6	89.1

Based on alternator efficiency of 96%.

H35DFV Bore: 350mm Stroke: 400mm



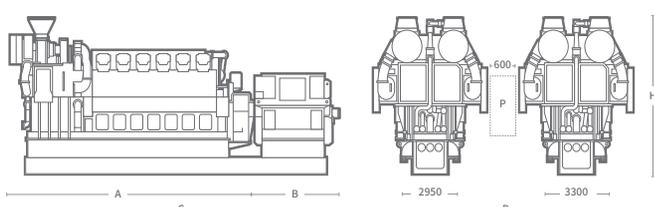
Main Data

Dimensions

Speed	720rpm		750rpm		Dimension(mm)				Dry Mass(ton)	
	60Hz		50Hz							
	Eng.(kW)	Gen.(kW)	Eng.(kW)	Gen.(kW)	A	B	C	H	Engine	GenSet
12H35DFV	5,760	5,558	5,760	5,558	6,624	3,760	10,384	4,723	56.0	108.8
14H35DFV	6,720	6,518	6,720	6,518	7,295	3,860	11,155	4,723	63.3	121.3
16H35DFV	7,680	7,449	7,680	7,449	7,914	3,479	11,393	4,723	69.1	130.9
18H35DFV	8,640	8,380	8,640	8,380	8,585	3,859	12,444	4,794	76.3	141.2
20H35DFV	9,600	9,360	9,600	9,360	9,344	3,659	13,003	4,794	84.0	153.9

Based on alternator efficiency of 96.5-97.5%.

H54DFV Bore: 540mm Stroke: 600mm



Main Data

Dimensions

Speed	600rpm		Dimension(mm)				Dry Mass(ton)	
	50/60Hz							
	Eng.(kW)	Gen.(kW)	A	B	C	H	Engine	GenSet
12H54DFV TSTC	17,640	17,199	12,416	4,393	16,809	8,319	300.9	398.4
14H54DFV TSTC	20,580	20,066	13,566	4,337	17,903	8,319	331.8	438.8
16H54DFV TSTC	23,520	22,932	14,991	4,522	19,513	8,614	371.1	488.8
18H54DFV TSTC	26,460	25,799	16,141	4,692	20,833	8,614	402.7	531.7

Based on alternator efficiency of 97.5%.

RELIABLE & POWERFUL SUPPORT AROUND THE WORLD

- Optimized Solutions For Each Customer’s Needs
- Genuine Spare Parts From The Original Equipment Manufacturer
- Fast and Reliable Response Through Our Global Service Network
- 24/7, Immediate Support



Contact Us

Power Plant

Engine Power Plant Sales Department
 1000, Bangeojinsunhwan-doro, Dong-gu, Ulsan, Korea
 (Zip Code: 44032)
Tel +82.31.210.9350~61 **E-mail** hi_pin@hhi.co.kr

Korean-English 24/7 Call Center
Tel +82.70.8670.1122

Customer Service

Hyundai Global Service Co. Ltd
 Centum Science Park 6F 79, Centum jungang-ro,
 Haeundae-gu, Busan, Korea (Zip code : 48058)
Tel +82.51.741.7601
 +82.52.204.7852 (For Warranty Service)
 +82.52.204.7824 (For Sales)
 +82.52.204.7703 (For Power Plant Service)

E-mail service@hyundai-gs.com
 sales@hyundai-gs.com
 powerplant@hyundai-gs.com



Global Leader
www.hhi.co.kr